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10/616,588	07/09/2003	Taehyun Jeon	3364P118	1286

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BLAKELY SOKOLOFF TAYLOR & ZAFMAN
12400 WILSHIRE BOULEVARD
SEVENTH FLOOR
LOS ANGELES, CA 90025-1030

EXAMINER	
VLAHOS, SOPHIA	
ART UNIT	**PAPER NUMBER**
2611	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	03/20/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No. 10/616,588	Applicant(s) JEON ET AL.	
	Examiner SOPHIA VLAHOS	Art Unit 2611	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 20 December 2006.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-3 and 5-11 is/are pending in the application.

4a) Of the above claim(s) 4 is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-3 and 6-11 is/are rejected.

7)☒ Claim(s) 5 is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 09 July 2003 is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Allowable Subject Matter

1. The indicated allowability of claim 4 (whose limitations have bee incorporated in claim 1) is withdrawn in view of the newly discovered reference(s) to Moose (U.S. 2002/0065047). Rejections based on the newly cited reference(s) follow.

Claim Objections

2. Claim 1 is objected to because of the following informalities:

Claim 1, step (b) recites: "..., and tracking **the** phase offset caused by the sampling frequency offset..." emphasis added, it is recommended to be revised as follows "..., and tracking **a** phase offset caused by the sampling frequency offset...". Also, step (b) further recites: "...that corresponds to **the phase offset** on the time axis by using..."; however previously in the claim two phase offsets are mentioned (one caused by the carrier frequency offset in (a) and the other one caused by the sampling frequency offset (b)) and for clarity it is suggested to revise the above as "...that corresponds to **the phase offset caused by the sampling frequency error** on the time axis by using..."

Claims 8 and 11 include a similar limitation (pointed out above, in claim 1) and should be revised in a similar manner.

Claim 2 recites: "...tracking the phase offset in consideration of..." similarly to claim 1, it should be clarified which phase offset is referred (does the "phase

offset" refer to the phase offset caused by the carrier frequency offset or the phase offset caused sampling frequency offset, or both phase offsets?)

Claim 6 also mentions "the tracked phase offset" and it should be clarified which one of the tracked phase offsets (or both of the tracked phase offsets) the above refers to.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent..

4. Claims 1, 2, 6, 11 are rejected under 35 U.S.C. 102(a) as being anticipated by Moose (U.S. 2002/0065047).

With respect to claim 1, Moose discloses: (a) detecting data received from the transmitter by using a first signal (see Fig. 8, where the first signal representing the transmitted signal corresponds to the signal in step 805 that is equalized (since it is divided by the channel response) and whose pilot tones are extracted (, and see paragraphs [0038]-[0039] where the invention relates to an OFDM receiver that is understood to process signals transmitted from a transmitter)), and tracking a phase offset caused by the carrier frequency offset by using the detected received data (paragraph [0043] lines 13-19 where the

zero order term of the line is an average phase change (phase offset) and provides an estimate of carrier frequency offset, see Fig. 8 , steps 803, 805, 811, and 813, and see equation (48) the equation of the total phase error where γ_m is the phase offset caused by the carrier frequency offset);(b) detecting the data received from the transmitter by using the first signal, and tracking the phase offset caused by the sampling frequency offset by using the detected received data (see Fig. 8, steps 805, 811 paragraph [0043] lines 23-29, the first order term of the phase offset line is caused by the timing (sampling) error, and paragraphs [0096] up to paragraph [0102] where μ_m the phase offset is given by equations (46) and (47), and the term μ_m is included in the line equation of the total phase shift) including calculating a gradient value of a straight line that corresponds to the phase offset on the time axis by using a linear regression method (see step 811 of Fig. 8, the least squares fit to straight line (i.e. linear regression) to obtain μ_m which is proportional to frequency (straight line) , therefore its gradient is the sampling offset in time domain);(c) compensating for the phase offset caused by the carrier frequency offset between the transmitter and the receiver according to the phase offset tracked in (a) (see Fig.8, where phase offset γ_m is used to calculate frequency offset error (steps 813-814) and apply the frequency offset correction at step 801) ; and (d) compensating for the phase offset caused by the sampling frequency offset between the transmitter and the receiver according to the phase offset tracked in (b) (see paragraphs [0106]-[0107] and [0109]-[0110] eq. (52) and (53) where the timing error is monitored and the first sample point of

the following OFDM data symbol processing is slipped forward or backward (i.e. compensated)).

With respect to claim 2, all of the limitations of claim 2 are analyzed above in claim 1, and Moose discloses: comprising tracking the phase offset in consideration of a gain value of each subchannel on which a pilot signal is located (see first sentence of paragraph [0044] where the AGC (automatic gain control) is performed that sets a gain value for the transmitted signal that includes the subcarriers (ofdm subchannels see Fig. 1 OFDM PHY Layer symbols, including pilot subcahnnels), therefore in the phase offset calculation the gain value of each subchannel where pilot signals are located takes into account gain values of subchannels where pilot signals are located)

With respect to claim 6, all of the limitations of claim 6, are analyzed above in claim 1, and Moose discloses: further comprising: removing unnecessary noise of a frequency band by filtering the tracked phase offset (see last sentence of paragraph [0092] where it is interpreted that the averaging of the tracked phase offsets of Moose corresponds to the claimed filtering).

With respect to claim 11, claim 11 is rejected under a rationale similar to the one used to reject claim 1 above.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Moose (U.S. 2002/0065047) in view of Lou et. al. (7,065,146).

With respect to claim 3 all of the limitations of claim 3 are analyzed above in claim 1, but Moose does not expressly teach: further comprising comparing a Euclidean distance between the first signal and theoretical signals, and detecting the received data by using the theoretical value that corresponds to the nearest distance.

In the same field of endeavor (ofdm signal processing), Lou et. al., discloses: comparing a Euclidean distance between the first signal and theoretical signals, and detecting the received data by using the theoretical value that corresponds to the nearest distance (see block 830 of Fig. 8 the Viterbi deocoder, see column 5, lines 44-53 description of branch metric computation based on the minimum Euclidean distance, and column 7,lines 33-42 estimation of the most likely symbol/data transmitted based on the computed branch metrics).

At the time of the invention, it would have been obvious to a person skilled in the art to modify Moose et. al., based on the teachings of Lou et. al., so that

the step of comparing a Euclidean distance between the first signal and theoretical signals, and detecting the received data by using the theoretical value that corresponds to the nearest distance., takes place in the system of Moose and the motivation behind the above modification is to use the most likely transmitted symbol when performing the phase offset computations.

7. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Moose (U.S. 2002/0065047) in view of Kim et. al., (U.S. 2003/0053564).

With respect to claim 7, all of the limitations of claim 7 are analyzed above in claim 1, but Moose does not expressly teach: wherein the first signal has passed through a frequency domain equalizer (although Moose indirectly teaches equalization in the frequency domain see step 805 of Fig. 8 where the channel response is taken into account in signal processing).

In the same field of endeavor, Kim et. al. discloses a first signal has passed through a frequency domain equalizer (see Fig. 3, FEQ element 38 equalizing the first signal, the output of FFT, see paragraph [0036]).

At the time of the invention, it would have been obvious to a person skilled in the art to modify the process of Moose (the processing described at step 805) based on the teachings of Kim et. al., so that the first signal has passed through a frequency domain equalizer so that channel distortions such as phase shift and amplitude change are compensated (see paragraph [0036] of Kim et. al.).

8. Claims 8-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ghosh (U.S. 5,802,118) in view of Moose (U.S. 2002/0065047).

With respect to claim 8, Ghosh discloses: an analog/digital converter for converting a signal received by the receiver into a digital signal (see Fig. 1, element 11, "A/D"); a guard interval remover for removing a guard interval from the converted digital signal (Fig. 1, element 14, "remove guard"); an FFT (fast Fourier transform) unit for transforming the guard-interval-removed signal into a signal in a frequency domain (Fig. 1, element 20 "FFT"); an FEQ (frequency domain equalizer) for recovering a signal distorted by a communication channel from the converted signal in the frequency domain (see Fig. 1, element 22 "Equalizer", column 6 lines 1-3 where the (frequency domain) equalizer takes into account the frequency response out of channel estimator21 shown in Fig. 1));

Ghosh et. al. do not expressly teach: an offset tracker/compensator for tracking a phase offset caused by the carrier frequency offset and the sampling frequency offset and compensating for the same by using the signal received from the FEQ, tracking the phase offset caused by the sampling frequency offset includes calculating a gradient value of a straight line that corresponds to the phase offset on the time axis by using a linear regression method.

In the same field of endeavor Moose discloses: an offset tracker/compensator for tracking a phase offset caused by the carrier frequency offset and the sampling frequency offset and compensating for the same by using the signal received from the FEQ, tracking the phase offset caused by the

sampling frequency offset includes calculating a gradient value of a straight line that corresponds to the phase offset on the time axis by using a linear regression method (see method steps of Fig. 8 performed by specific components, see steps following FFT processing and see paragraphs [0104]-[0110] the frequency offset error and the sampling clock frequency error).

At the time of the invention, it would have been obvious to a person skilled in the art to modify the system of Ghosh et. al so based on the teachings of Moose, so that it includes an offset tracker/compensator for tracking a phase offset caused by the carrier frequency offset and the sampling frequency offset and compensating for the same by using the signal received from the FEQ, tracking the phase offset caused by the sampling frequency offset includes calculating a gradient value of a straight line that corresponds to the phase offset on the time axis by using a linear regression method (as disclosed by Moose). The motivation to perform such a modification is that the system of Moose allows for continuous tracking and correction throughout the packet (see paragraph [0112] of Moose).

With respect to claim 9, all of the limitations of claim 9, are analyzed above in claim 8, and the system obtained from the combination of Ghosh and Moose includes: wherein the offset tracker/compensator detects data received from the transmitter by using the signal received from the FEQ (see Fig. 8 where the pilot tones are used and the phase offset is extracted based on the pilots), and tracks the phase offset caused by the carrier frequency offset and the

sampling frequency offset by using the detected received data (Fig. 8 of Moose, steps subsequent to step 805 and paragraphs [01-04]-[0110]).

With respect to claim 10, all of the limitations of claim 10, are analyzed above in claim 9, and the system obtained from the combination of Ghosh and Moose includes: wherein the offset tracker/compensator tracks the phase offset in consideration of a gain value of each subchannel on which a pilot signal is provided (Moose, see paragraph [0044] the AGC operation that sets a gain for the received signal (including the subcarriers and the corresponding tones)).

Allowable Subject Matter

9. Claim 5 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to SOPHIA VLAHOS whose telephone number is 571 272 5507. The examiner can normally be reached on MTWRF 8:30-17:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mohammed Ghayour can be reached on 571 272 3021.

The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

SV
3/8/2007

M. G.
MOHAMMED GHAYOUR
SUPERVISORY PATENT EXAM